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# rubella



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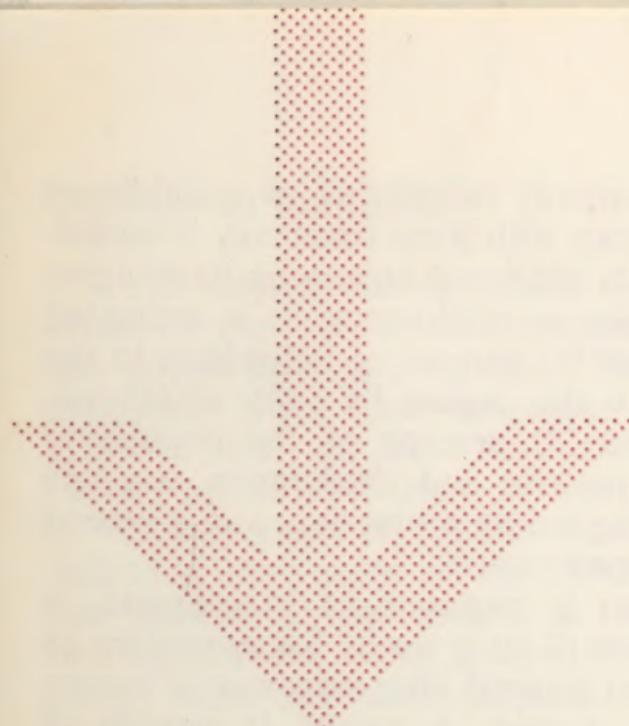
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# rubella

Rubella, commonly known as German measles, and occasionally also referred to as the "3-day measles," is an infectious disease caused by a virus. Because it is usually a very mild disease and complications are not common, rubella received little attention until 1941, when it became implicated as a cause of congenital malformations in infants whose mothers had the disease in pregnancy.

During an epidemic of rubella in Australia, Dr. N. M. Gregg, an ophthalmologist, observed a high incidence of cataracts and other anomalies in infants born to mothers who had the disease early in pregnancy. Since this important observation, studies have firmly established the harmful effect of rubella on fetuses and infants. Thus a disease previously considered innocuous is now recognized as a grave threat to pregnant women.

Rubella attracted special attention when it became known that a large number of babies with congenital abnormalities were born to mothers infected in the nationwide epidemic of 1964-65. Epidemic peaks tend to occur every 6 to 9 years. The next epidemic of rubella is predicted to occur in the early 1970's.

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Although commonly referred to as a childhood disease, rubella occurs with some frequency in adolescents and adults. Its incidence among adults is higher than that of measles or chickenpox. It is estimated that between 80 to 90 percent of individuals in the United States have the disease by early adulthood, thus leaving 10 to 20 percent of the population susceptible. Like measles and chickenpox, a single attack provides long-lasting protection, and a second infection almost never occurs.

After a person is exposed to the disease, it generally takes from 2 to 3 weeks for symptoms to develop. This silent interval after exposure is known as the incubation period. A person is capable of spreading the disease during this period, and he remains contagious for several days after the onset of symptoms. The difficulty of controlling the spread of such a disease is readily apparent, since exposure of susceptible persons often takes place without anyone's knowledge.

## Symptoms

Typically, rubella has a relatively mild course. In children, the appearance of a rash may be the first sign of the illness noticed by parents. The rash starts on the face and spreads rapidly down the body and limbs. It usually lasts about 3 days, hence the name "3-day measles." It may disappear before the third day, and, occasionally, rubella occurs without any rash at all. The appearance of the rash varies, and may resemble measles, scarlet fever, roseola, other viral diseases such as the Echo virus and Coxsackie virus infections, and rash caused by allergy. Low-grade fever is usually present with the rash. Swelling of the lymph glands behind the ears, in the neck, and near the posterior prominent part of the head generally precedes the onset of rash by a few days. At the beginning, these glands are painful when touched, but the tenderness usually subsides in a day or two, while the swelling persists a little longer. Other symptoms such as general malaise or discomfort, headache, loss of appetite, sore throat, and inflammation of the eyes are more common in adolescents and adults than in children.

Complications of rubella, though less common than in measles, were reported with increased frequency in the 1964-65 epidemic. Arthritis, encephalitis, and a bleeding tendency associated with low blood platelets (a blood element essential in the process of blood clotting) have all been described. Transient arthritic symptoms were reported with some frequency in adults, particularly among women.

## Damage to the fetus

The importance of rubella lies in its damaging effect on the fetus when a pregnant woman contracts the disease early in pregnancy. The first 3 months of pregnancy is the most dangerous period, but there is evidence that the fetus may also be affected when rubella occurs after this period or prior to conception. A followup study of children born after the epidemic indicated that many of the children whose mothers had rubella in the second or third trimester had hearing defects, were delayed in language development, were mentally retarded, or were of small stature.

The exact incidence of affected infants among all infants born after rubella-complicated pregnancies is not known, though it is generally agreed that the earlier the infection, the higher the incidence. It has been estimated that about 15-20 percent of infants born to mothers infected in the first 3 months of pregnancy have some kind of grossly discernible malformation. In addition, many suffer partial hearing loss which often escapes detection in early life. The incidence of congenital malformations is much higher in infants of mothers who contract rubella in the first 8 weeks of pregnancy. These infants are also more likely to have multiple anomalies.

The term "rubella syndrome" refers to the various congenital abnormalities which may be present, either singly or in combination, in infants born of a pregnancy complicated by rubella. Until the 1964-65 epidemic, four main categories were generally included in the rubella syndrome:

1. Hearing loss in one or both ears and of varying degree. Often it is not detected at birth and sometimes not until a child reaches school age.

2. Eye defects, most commonly described of which are cataracts, glaucoma, unusually small size of the eyeball, lesions of the retina, and clouding of the cornea not associated with glaucoma.

3. Heart defects, which also may not be apparent at birth.

4. Abnormalities of the central nervous system, the most common of which are abnormally small size of the head and mental retardation.

Following the epidemic, many affected infants were born who presented abnormal features not usually included in the rubella syndrome. These are sometimes referred to as features of the "expanded rubella syndrome" or what is more properly called congenital rubella. They include:

1. Small size at birth despite a full-term pregnancy. Many of these infants weigh less than 5

pounds at birth. An infant born at term weighing 2 pounds 2 ounces was reported. Many of these infants have feeding problems and gain weight very slowly. Diarrhea also occurs with some frequency in these infants.

2. Bleeding tendency associated with low blood platelets, known as thrombocytopenic purpura. This is generally manifested in these infants as reddish or purplish spots scattered over the entire body, particularly over the face. Some infants on blood test are found to have abnormally low blood platelets but present no external evidence of a bleeding tendency.

3. Enlarged liver and spleen.

4. Jaundice, caused by excessive bile pigments in the blood, and manifested as yellowish discoloration of the skin and white part of the eyeball (sclera).

5. Swollen lymph nodes. A single node or many in different parts of the body may be involved.

6. Hepatitis, or inflammation of the liver.

7. Lesions which involve bones of the arms and legs, detectable only by X-ray.

8. Anemia and occasionally low white blood cell count.

9. Pneumonia.

10. Encephalitis and meningitis, usually indicated by a full fontanel, abnormal spinal fluid, irritability, convulsions and other symptoms. X-ray of the skull often reveals an enlarged anterior fontanel.

11. Injury of the heart muscles evidenced by symptoms of heart failure and abnormal electrocardiographic tracings.

12. Abnormal fingerprints, palmar creases, and other skin patterns.

13. Other congenital malformations and lesions.

A relatively high mortality rate was reported among affected infants born following the 1964-65 epidemic. Some died shortly after birth, others within the first few weeks or months of life. Studies made during this epidemic confirmed that infants with congenital rubella are infected with the virus in utero. Many are not only infectious at birth, but continue to suffer further damage by the virus after birth. This is exemplified by the development of eye lesions in some infants after they are born. In the newborn period and for several months thereafter, even for 2-3 years, rubella virus has been detected in these infants. The virus has also been isolated from apparently normal newborn infants of infected mothers, suggesting that some infected fetuses may escape damage by the rubella virus. The most frequent source from which the virus has been recovered is the throat. Other sources reported include urine, feces, spinal fluid, blood, and eyes. Examination of aborted

fetuses and infants who have died revealed that the rubella virus can be recovered from almost all the organs of the body, such as the brain, heart, lungs, liver, spleen, kidneys, intestines, lymph nodes, skin and bones. It is thus evident that infants with congenital rubella are capable of spreading the infection, and there have been several reports of doctors and nurses who developed rubella after caring for these babies.

## Diagnosis

The diagnosis of rubella on the basis of signs and symptoms has many pitfalls. As mentioned earlier, the rubella rash is often confused with rashes seen in other infectious diseases; or, there may be no rash at all. Swollen, tender glands in the locations described are highly suggestive of rubella, yet taken alone they cannot be used to diagnose rubella with certainty. Furthermore, so-called "subclinical infection" can take place with minimal or no apparent symptoms. In the latest epidemic many affected infants were born to mothers totally unaware that they had had rubella during pregnancy.

A positive diagnosis of rubella must therefore depend either on isolation of the rubella virus from the throat or other body tissues of the patient, or on blood tests. While isolation of the virus probably indicates a relatively recent infection, a single positive blood test means only that a person has been infected with the rubella virus some time in her life. To determine whether the infection is recent or not, doctors make two blood tests. Usually, one blood specimen is taken as soon as a person is exposed to rubella or, if exposure is not known, as soon as symptoms suggestive of rubella appear. A second specimen is taken 2 to 4 weeks later. A significant difference in the results of the two blood tests indicates that the infection is recent.

Until recently it took 2 weeks to obtain the results of each blood test, but a newly developed technique makes it possible to obtain the results of a test within several hours. This procedure, known as the hemagglutination inhibition, or HI, test, can be used to confirm rubella infection in the absence of clinical symptoms and also to detect immunity years after infection. In most States the test is available from the State health department laboratory. Because of the variation among reagents and technical procedures, results of the HI and other blood tests should be accepted only from laboratories of recognized competence that perform these tests regularly.

## The vaccine

Unless a complication occurs, rubella seldom requires treatment. Control of this disease is aimed at preventing its occurrence in pregnant women, and the development of a vaccine which can be given to girls before they reach the childbearing age has been the goal. The achievement of this objective became a definite possibility when the rubella virus was isolated in 1962. This crucial step made possible the development of a vaccine for rubella similar to that for polio and measles.

In early 1966, Drs. H. M. Meyer and P. D. Parkman, Jr., of the National Institutes of Health, announced the development of a live rubella virus vaccine. In their preliminary studies, the vaccine proved to be effective in inducing immunity against the disease, did not cause symptoms in those inoculated, and was not contagious. Also, since the duration of immunity that can be induced is important, it is encouraging that the first group of girls inoculated with the vaccine show very little decline 3 years later in the level of vaccine-induced protective antibodies in their blood. Long-term protection against the infection is therefore likely, but the exact duration of protection can be established only by continued observation.

To date, more than 45,000 susceptible children have received live rubella virus vaccine in field investigations, with almost no untoward reactions. Only rarely have transient arthralgia (pain in joints) and rash been reported in children. But among susceptible women who were vaccinated, many developed swollen lymph glands, arthralgia or transient arthritis 2 to 4 weeks after vaccination. Fever and rash occurred less frequently.

## Who should be vaccinated

The live rubella virus vaccine was licensed and made available in June 1969. The Public Health Service Advisory Committee on Immunization Practice along with the American Academy of Pediatrics Committee on the Control of Infectious Diseases recommends that the vaccine be used for boys and girls between the ages of 1 year and puberty. It should not be given to infants less than 1 year old because of possible poor response due to persisting maternal rubella antibody in the infant. Initial priority for vaccination is to be given to children in kindergarten and the early grades of elementary school because they are the major source of infection.

for susceptible pregnant women.

Since the effect of the live virus vaccine on the fetus is unknown and poses a theoretical risk of causing congenital malformation, pregnant women should not be given the vaccine. Women of childbearing age may be considered for vaccination only when the possibility of pregnancy in the following 2 months is essentially nil, and each case must be considered individually. Routine vaccination of adolescent girls and adult women should not be undertaken because of the danger of inadvertently administering the vaccine to women unaware that they are pregnant.

Before rubella vaccine became available, deliberate exposure of young girls to rubella before the childbearing age had been advocated by many. However, this carries with it the danger of spreading the infection through these girls to their mothers or other contacts who may be pregnant. In the past, injection of gamma globulin was also used in an attempt to protect pregnant women exposed to rubella. But according to the 1966 Report of the Committee on the Control of Infectious Diseases of the American Academy of Pediatrics, "Recent observations indicate that immune serum globulin (gamma globulin) even in large dosage may have modified the disease by reducing the incidence of rash, but failed in some instances to prevent infection. . . . In view of these findings, the value of immune serum globulin is questionable." Thus while gamma globulin may prevent symptoms of rubella, it is not yet known if it will prevent damaging effects on the baby. Some scientists believe that convalescent gamma globulin (prepared from the blood of persons convalescing from the disease to insure higher potency) may afford better protection than gamma globulin prepared from any other source.

## Care of affected infants

Infants born after a pregnancy complicated by rubella should be carefully examined at birth for possible congenital malformations. Since some of these infants are capable of spreading the infection, isolation has been recommended. Regular followup examinations are indispensable even in infants apparently normal at birth, because certain defects like partial hearing loss and mental retardation may not become evident until later. For many of the congenital malformations, such as cataracts, glaucoma, and congenital heart defects, surgery is now possible. Early diagnosis, treatment, and followup care, includ-

ing special educational services, will improve the outlook for many children born with congenital rubella. Existing services for handicapped children should be utilized in the care and training of these children.

With the development of the rubella vaccine and the encouraging results reported from the field investigations, one can look forward to the day when rubella as a cause of miscarriage, stillbirth, congenital malformation and disease in infants will be reduced to a minimum. To achieve the most benefit from the vaccine now available, however, major public health efforts will have to be made throughout the country. By reducing to a minimum the susceptible population through widespread and continuous immunization programs, the predicted epidemic of the '70's and of future decades can be avoided. The programs must include public education as well as immunization. Much of the general public is not yet aware of the significance of rubella. During the epidemic of 1964-65 it was found that many women, particularly in low-income groups, did not know of the causal relationship between the disease and congenital malformations:





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